

WHAT IS CLAIMED IS:

1. A method of making a semiconductor device including inductors comprising the steps of;

5 forming a semicircle columnar groove in an insulating layer on a semiconductor substrate;

forming underlying conductive lines with a predetermined distance therebetween on said groove;

forming a cylindrical insulating layer in said groove formed with said underlying conductive lines and on the surface of said substrate; and

forming upper conductive lines on said insulator to contact with said underlying conductive lines.

2. A method of making a semiconductor device including inductors as claimed in Claim 1, wherein said step of forming said groove further comprises the steps of:

forming a nitride film on said insulating layer;

forming a photosensitive film pattern for exposing said nitride film for a groove;

etching said nitride film by using said photosensitive film pattern as a mask to be exposed said insulating layer for forming said groove; and

etching said exposed insulating layer.

20 3. A method of making a semiconductor device including inductors as claimed in Claim 2, wherein said etching step is performed by any one of an isotropic etching method and a mixed method of anisotropic etching and isotropic etching.

4. A method of making a semiconductor device including inductors as claimed in Claim 1, wherein said underlying conductive lines are slantly longitudinally formed along said groove to

across.

5. A method of making a semiconductor device including inductors as claimed in Claim 1, further comprises the steps of:

forming an insulating layer on the surface of said underlying conductive lines;

5 covering the entire surface of said substrate formed with said insulating layer with an oxidization prevention layer; and

burying bury material between said upper conductive lines in said groove.

6. A method of making a semiconductor device including inductors as claimed in Claim 5, wherein said buried material is a flux material, such as spin on glass.

10 7. A method of making a semiconductor device including inductors as claimed in Claim 6, wherein said buried material is buried until said oxidization prevention layer is exposed when said flux material is etched back.

15 8. A method of making a semiconductor device including inductors as claimed in Claim 5, further comprising the step of forming a contact region by etching said insulating layer and said oxidization prevention layer for connecting said underlying and upper conductive lines after the burying step.

9. A method of making a semiconductor device including inductors as claimed in Claim 5, wherein said insulating layer is formed by oxidization of said underlying conductive lines.

20 10. A method of making a semiconductor device including inductors as claimed in Claim 5, wherein an oxide film is formed on said underlying conductive lines.

11. A method of making a semiconductor device including inductors as claimed in Claim 1, wherein said the step of forming said insulating layer comprises the steps of;

laminating an oxidizable material on the entire surface of said substrate to thereby be entirely buried said groove; and

forming said insulating layer on the surface of said substrate and said groove by oxidization of said oxidizable material.

12. A method of making a semiconductor device including inductors as claimed 11, wherein said step of filling said groove with oxidizable materials further comprises the steps of:

5 laminating oxidizable materials on the entire of said substrate to thereby buried said groove; and

etching said oxidizable materials to fill only in said groove.

13. A method of making a semiconductor device including inductors as claimed 12, wherein said oxidizable materials is any one of polysilicon or amorphous silicon.

10 14. A method of making a semiconductor device including inductors as claimed in Claim 11, wherein said oxidizable material is etched by CMP process.

15 15. A method of making a semiconductor device including inductors as claimed in Claim 11, wherein said step of etching said oxidizable materials is performed by etch-back method.

15 16. A method of making a semiconductor device including inductors as claimed in Claim 1, wherein said upper conductive lines are slantly longitudinally formed with a predetermined distance therebetween to across said groove in the opposite direction of said underlying conductive lines.

20 17. A method of making a semiconductor device including inductors, comprising the steps of:

forming a semicircle groove in an insulating layer on a semiconductor substrate;

forming underlying conductive lines with a predetermined distance therebetween to across groove;

forming a magnetic core in said groove formed with said underlying conductive lines;
and

forming upper conductive lines on said magnetic core, said upper conductive lines being contacted with said underlying conductive lines.

5 18. A method of making a semiconductor device including inductors as claimed in Claim 17, wherein said step of forming groove comprises the steps of;

forming an oxide film as a relief region on said substrate;

forming a silicon nitride layer and an oxide film in high temperature on said oxide film;

forming a trench by etching said oxide film, silicon nitride layer and oxide film in high

10 temperature;

forming an oxide film on the entire surface of said substrate;

forming an semicircle groove by wet-etching said oxide film; and

removing said oxide film, silicon nitride layer and oxide film in high temperature.

15 19. A method of making a semiconductor device including inductors as claimed in Claim 17, wherein said step of forming underlying conductive lines comprises the steps of;

forming an oxide film on the entire surface of said substrate;

forming a conductive material on said oxide film; and

forming underlying conductive lines with a predetermined distance therebetween along

20 said groove by patternizing said conductive material.

20. A method of making a semiconductor device including inductors as claimed in Claim 19, wherein said underlying conductive lines are formed with a predetermined distance therebetween to across said groove.

21. A method of making a semiconductor device including inductors as claimed in Claim 19,

wherein said underlying conductive lines is made of aluminum or copper having low resistance value.

22. A method of making a semiconductor device including inductors as claimed in Claim 17, wherein said step of forming said magnetic core comprises the steps of;

5 forming an oxide film, a magnetic material and a capping oxide layer in order on said substrate formed with said underlying conductive lines;

 forming said magnetic core in said groove by patternizing said magnetic material; and
 wrapping said magnetic core with said oxide film by forming a spacer at both side of said magnetic core.

10 23. A method of making a semiconductor device including inductors as claimed in Claim 17, wherein said upper conductive lines are slantly longitudinally formed with a predetermined distance therebetween along said groove to across.

15 24. A method of making a semiconductor device including inductors as claimed in Claim 23, wherein said underlying conductive lines are made of aluminum or copper having low resistance value.

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